

Amendments to the Claims:

The listing of claims below will replace all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently amended) A composite polyamide reverse osmosis membrane comprising:
 - (a) a microporous support;
 - (b) a polyamide layer on said microporous support; and
 - (c) a hydrophilic coating on said polyamide layer, said hydrophilic coating being made by (i) applying to the polyamide layer a quantity of a polyfunctional epoxy compound, said polyfunctional epoxy compound comprising at least ~~two~~ three epoxy groups, and (ii) then, cross-linking the polyfunctional epoxy compound in such a manner as to yield a water-insoluble polymer, wherein said polyfunctional epoxy compound is cross-linked through at least one of self-polymerization and the help of a cross-linking compound, said cross-linking compound differing from said polyamide layer.
2. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 1 wherein said microporous support is made of a material selected from the group consisting of a polysulfone, a polyether sulfone, a polyimide, a polyamide, a polyetherimide, polyacrylonitrile, poly(methyl methacrylate), polyethylene, polypropylene and a halogenated polymer.
3. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 1 wherein said polyamide layer is the interfacial reaction product of a polyfunctional amine and a polyfunctional amine-reactive reactant.

4. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 3 wherein said polyfunctional amine is at least one member selected from the group consisting of an aromatic primary diamine and substituted derivatives thereof, an alkane primary diamine, a cycloaliphatic primary diamine, a cycloaliphatic secondary diamine, an aromatic secondary diamine and a xylylene diamine.

5. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 4 wherein said polyfunctional amine is meta-phenylenediamine.

6. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 4 wherein said polyfunctional amine is piperazine.

7. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 3 wherein said polyfunctional amine-reactive reactant is at least one member selected from the group consisting of a polyfunctional acyl halide, a polyfunctional sulfonyl halide and a polyfunctional isocyanate.

8. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 7 wherein said polyfunctional amine-reactive reactant is trimesoyl chloride.

Claim 9 (Canceled).

10. (Currently amended) The composite polyamide reverse osmosis membrane as claimed in claim 9 1 wherein said polyfunctional epoxy compound is at least one member selected from the group consisting of glycerol triglycidyl ether; diglycerol triglycidyl ether; pentaerythritol triglycidyl ether; sorbitol triglycidyl ether; glycerol propoxylate triglycidyl ether; trimethylolpropane triglycidyl ether; 1,1,1-tris(hydroxymethyl)ethane triglycidyl ether; 1,1,1-tris(hydroxyphenyl)ethane triglycidyl ether; tris(hydroxymethyl)nitromethane triglycidyl ether; tris(2,3-epoxypropyl)isocyanurate;

phloroglucinol triglycidyl ether; N,N-diglycidyl-4-glycidyloxyaniline; a reaction product of epichlorohydrin and 1,3,5,-tris(2-hydroxyethyl)cyanuric acid; a reaction product of epichlorohydrin and tris(hydroxymethyl)amino methane; sorbitol tetraglycidyl ether; pentaerythritol tetraglycidyl ether; polyglycerol tetraglycidyl ether; ~~and 4,4'-methylenebis(N,N-diglycidylaniline)~~; sorbitol pentaglycidyl ether; sorbitol hexaglycidyl ether; polyglycerol polyglycidyl ether; ~~epoxy cresol novolac resin~~; a reaction product of polyvinyl alcohol and epichlorohydrin; a reaction product of polyvinyl phenol and epichlorohydrin; a reaction product of polyacrylamide and epichlorohydrin; a reaction product of epichlorohydrin and cellulose; and a reaction product of epichlorohydrin and a cellulose derivative.

11. (Currently amended) The composite polyamide reverse osmosis membrane as claimed in claim 9 1 wherein said polyfunctional epoxy compound is cross-linked through self-polymerization.

12. (Currently amended) The composite polyamide reverse osmosis membrane as claimed in claim 9 1 wherein said polyfunctional epoxy compound is cross-linked with the help of a said cross-linking compound.

13. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 12 wherein said cross-linking compound comprises at least two epoxy-reactive groups selected from the group consisting of hydroxy groups; amino groups; carboxyl groups; carboxylic acid anhydride groups; amide groups; carbonyl groups; and sulfurhydryl (thiol) groups.

14. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 13 wherein said at least two epoxy-reactive groups are the same.

15. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 13 wherein said at least two epoxy-reactive groups are different.

16. (Currently amended) The composite polyamide reverse osmosis membrane as claimed in claim 13 wherein said cross-linking compound is at least one member selected from the group consisting of ethylene glycol; propylene glycol; 1,3-propanediol; 1,3-butanediol; 1,4-butanediol; 1,5-pentanediol; 1,2-pentanediol; 2,4-pentanediol; 1,6-hexanediol; 1,2-hexanediol; 1,5-hexanediol; 2,5-hexanediol; 2-ethyl-1,3-hexanediol; 1,7-heptanediol; 1,2-octanediol; 1,8-octanediol; 1,9-nonanediol; 1,10-decanediol; 1,2-decanediol; 1,12-dodecanediol; 1,2-dodecanediol; glycerol; trimethylolpropane; 1,1,1-tris(hydroxymethyl)ethane; 1,1,1-tris(hydroxyphenyl)ethane; tris(hydroxymethyl)aminomethane; tris(hydroxymethyl)nitromethane; 1,3,5-tris(2-hydroxyethyl)cyanuric acid; pentaerythritol; sorbitol; glucose; fructose; maltose; mannose; glucosamine; mannosamine; a polysaccharide; neopentyl glycol; dibromoneopentyl glycol; hydroquinone, resorcinol; bisphenol A; hydrogenated bisphenol A; isocyanuric acid; phloroglucinol; methylenebis(aniline); ~~novolac resin~~; polyvinyl alcohol; polyvinyl phenol; polyacrylamide; cellulose; ethylcellulose; methyl cellulose; hydroxypropyl cellulose; hydroxyethyl cellulose; polyethylene glycol with the repeating ethylene glycol unit $(\text{CH}_2\text{CH}_2\text{O})_n$ wherein n ranges from 2 to 400, inclusive; and polypropylene glycol with the repeating ethylene glycol unit $((\text{CH}_3)\text{CH}_2\text{CH}_2\text{O})_n$ wherein n ranges from 2 to 100, inclusive.

17. (Currently amended) The composite polyamide reverse osmosis membrane as claimed in claim 13 wherein said cross-linking compound is at least one member selected from the group consisting of alkanediamines and their alkyl or aryl derivatives on nitrogens and backbone carbons of the types shown below:

~~H₂N(CH₂)_nNH₂ wherein n=2-12;~~

R₁R₂N(CH₂)_nNR₃R₄ wherein n=2-12 and R₁, R₂, R₃ and R₄ are the same or different and are selected from the group consisting of hydrogen, methyl, ethyl, propyl, butyl, cyclohexyl and phenyl;

$$\begin{array}{c} \text{R}_5 \\ | \\ \text{H}_2\text{N}(\text{CH}_2)_n\text{NH}_2 \end{array} \text{ and } \begin{array}{c} \text{R}_5 \\ | \\ \text{R}_1\text{R}_2\text{N}(\text{CH}_2)_n\text{NR}_3\text{R}_4 \end{array}$$
 wherein n=2-12 and R₁, R₂, R₃, R₄ and R₅ are the same or different and are selected from the group consisting of hydrogen, methyl, ethyl, propyl, butyl, cyclohexyl, hydroxyl and phenyl;

Alicyclic diamines selected from the group consisting of diaminocyclohexane; 1,3-cyclohexanebis(methylamine); 4,4'-trimethylenedipiperidine; piperazine; 1,4-dimethylpiperazine; 1,4-diazabicyclo[2.2.2]octane; 1,8-diazabicyclo[5.4.0]undec-7-ene; 1,5-diazabicyclo[4.3.0]non-5-ene; and

Aromatic diamines selected from the group consisting of meta-phenylenediamine; meta-xylylenediamine; and bis(4-aminophenyl)sulfone.

18. (Currently amended) The composite polyamide reverse osmosis membrane as claimed in claim 13 wherein said cross-linking compound is at least one member selected from the group consisting of N,N'-bis(2-aminoethyl)-1,3-propanediamine, ~~diethylenetriamine, triethylenetetramine;~~ tris(2-aminoethyl)amine; N,N,N',N',N''-pentamethyldiethylenetriamine; triaminobenzene; 1,1,3,3-tetramethylguanidine; ~~polyethylenimine;~~ chitosan; poly(allylamine); and polyvinylpyridine.

19. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 13 wherein said cross-linking compound is at least one member selected from the group consisting of tartaric acid; gluconic acid; glucuronic acid; 3,5-dihydroxybenzoic acid; 2,5-

dihydroxybenzenesulfonic acid potassium salt; and 2,5-dihydroxy-1,4-benzenedisulfonic acid dipotassium salt.

20. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 13 wherein said cross-linking compound is at least one member selected from the group consisting of 3,5-diaminobenzoic acid; 2-aminoethanesulfonic acid (taurine); 2-[[tris(hydroxymethyl)methyl]amino]-1-ethanesulfonic acid; 3-[[tris(hydroxymethyl)methyl]amino]-1-propanesulfonic acid; 2-hydroxy-3-[[tris(hydroxymethyl)methyl]amino]-1-propanesulfonic acid; β -hydroxy-4-(2-hydroxyethyl)-1-piperazinepropanesulfonic acid; β,β' -dihydroxy-1,4-piperazinebis(propanesulfonic acid); and 2,5-diaminobenzenesulfonic acid.

21. (Currently amended) ~~The~~ A composite polyamide reverse osmosis membrane ~~as claimed in claim 1 wherein~~ comprising:

(a) a microporous support;

(b) a polyamide layer on said microporous support; and

(c) a hydrophilic coating on said polyamide layer, said hydrophilic coating being made by (i) applying to the polyamide layer a quantity of a polyfunctional epoxy compound, said polyfunctional epoxy compound comprises comprising exactly two epoxy groups, and (ii) then, cross-linking the polyfunctional epoxy compound in such a manner as to yield a water-insoluble polymer, wherein said polyfunctional epoxy compound is cross-linked through the help of a cross-linking compound, said cross-linking compound differing from said polyamide layer.

22. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 21 wherein said polyfunctional epoxy compound is at least one member selected from the group consisting of ethyleneglycol diglycidyl ether; propylene glycol diglycidyl ether; 1,3-propanediol

diglycidyl ether; 1,3-butanediol diglycidyl ether; 1,4-butanediol diglycidyl ether; 1,5-pentanediol diglycidyl ether; 1,2-pentanediol diglycidyl ether; 2,4-pentanediol diglycidyl ether; 1,6-hexanediol diglycidyl ether; 1,2-hexanediol diglycidyl ether; 1,5-hexanediol diglycidyl ether; 2,5-hexanediol diglycidyl ether; 2-ethyl-1,3-hexanediol diglycidyl ether; 1,7-heptanediol diglycidyl ether; 1,2-octanediol diglycidyl ether; 1,8-octanediol diglycidyl ether; 1,9-nonanediol diglycidyl ether; 1,10-decanediol diglycidyl ether; 1,2-decanediol diglycidyl ether; 1,12-dodecanediol diglycidyl ether; 1,2-dodecanediol diglycidyl ether; glycerol diglycidyl ether; trimethylolpropane diglycidyl ether; 1,1,1-tris(hydroxymethyl)ethane diglycidyl ether; pentaerythritol diglycidyl ether; sorbitol diglycidyl ether; neopentyl glycol diglycidyl ether; dibromoneopentyl glycol diglycidyl ether; hydroquinone diglycidyl ether; resorcinol diglycidyl ether; bisphenol A diglycidyl ether; hydrogenated bisphenol A diglycidyl ether; polyethylene glycol diglycidyl ether with the repeating ethylene glycol unit $(\text{CH}_2\text{CH}_2\text{O})_n$ wherein n is an integer ranging from 2 to 400, inclusive; and polypropylene glycol diglycidyl ether with the repeating propylene glycol unit $((\text{CH}_3)\text{CH}_2\text{CH}_2\text{O})_n$ wherein n is an integer ranging from 2 to 100, inclusive.

23. (Currently amended) The composite polyamide reverse osmosis membrane as claimed in claim 21 wherein ~~said polyfunctional epoxy compound is cross-linked using a cross-linking compound;~~ said cross-linking compound ~~having~~ has at least three epoxy-reactive groups.

24. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 23 wherein said at least three epoxy-reactive groups of said cross-linking compound are selected from the group consisting of hydroxy groups; amino groups; carboxyl groups; carboxylic acid anhydride groups; amide groups; carbonyl groups; and sulfurhydryl (thiol) groups.

25. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 24 wherein said at least three epoxy-reactive groups are the same.

26. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 24 wherein at least two of said at least three epoxy-reactive groups are different.

27. (Currently amended) The composite polyamide reverse osmosis membrane as claimed in claim 23 wherein said cross-linking compound is at least one member selected from the group consisting of N,N'-bis(2-aminoethyl)-1,3-propanediamine; ~~diethylenetriamine; triethylenetetramine;~~ tris(2-aminoethyl)amine; N,N,N',N',N''-pentamethyldiethylenetriamine; triaminobenzene; 1,1,3,3-tetramethylguanidine; ~~polyethylenimine;~~ chitosan; poly(allylamine); and polyvinylpyridine.

28. (Original) The composite polyamide reverse osmosis membrane as claimed in claim 23 wherein said cross-linking compound is at least one member selected from the group consisting of tartaric acid; gluconic acid; glucuronic acid; 3,5-dihydroxybenzoic acid; 2,5-dihydroxybenzenesulfonic acid potassium salt; and 2,5-dihydroxy-1,4-benzenedisulfonic acid dipotassium salt.

29. (Currently amended) The composite polyamide reverse osmosis membrane as claimed in claim 23 wherein said cross-linking compound is at least one member selected from the group consisting of glycerol; trimethylolpropane; 1,1,1-tris(hydroxymethyl)ethane; 1,1,1-tris(hydroxyphenyl)ethane; tris(hydroxymethyl)aminomethane; tris(hydroxymethyl)nitromethane; 1,3,5-tris(2-hydroxyethyl)cyanuric acid; pentaerythritol; sorbitol; glucose; fructose; maltose; mannose; glucosamine; mannosamine; a polysaccharide; isocyanuric acid; phloroglucinol; methylenebisaniline; ~~novolac resin;~~ polyvinyl alcohol; polyvinyl phenol; polyacrylamide; and cellulose and its derivatives.

Claims 30-57 (Canceled).

58. (Currently amended) A microporous membrane comprising:

(a) a microporous support; and

(b) a hydrophilic coating directly on said microporous support, said hydrophilic coating being made by (i) applying to the microporous support a quantity of a polyfunctional epoxy compound, said polyfunctional epoxy compound comprising at least ~~two~~ three epoxy groups, and (ii) then, cross-linking the polyfunctional epoxy compound in such a manner as to yield a water-insoluble polymer, wherein said polyfunctional epoxy compound is cross-linked through self-polymerization.

59. (Original) The microporous support as claimed in claim 58 wherein said microporous support is made of a material selected from the group consisting of a polysulfone, a polyether sulfone, a polyimide, a polyamide, a polyetherimide, polyacrylonitrile, poly(methyl methacrylate), polyethylene, polypropylene and a halogenated polymer.

60. (Original) The microporous support as claimed in claim 58 wherein said microporous support is a microfiltration membrane.

61. (Original) The microporous support as claimed in claim 58 wherein said microporous support is an ultrafiltration membrane.

Claims 62-70 (Canceled).

71. (New) The composite polyamide reverse osmosis membrane as claimed in claim 1 wherein said polyfunctional epoxy compound comprises at least four epoxy groups.

72. (New) The composite polyamide reverse osmosis membrane as claimed in claim 71 wherein said polyfunctional epoxy compound is at least one member selected from the group

consisting of sorbitol tetraglycidyl ether; pentaerythritol tetraglycidyl ether; polyglycerol tetraglycidyl ether; sorbitol pentaglycidyl ether; sorbitol hexaglycidyl ether; polyglycerol polyglycidyl ether; a reaction product of polyvinyl alcohol and epichlorohydrin; a reaction product of polyvinyl phenol and epichlorohydrin; a reaction product of polyacrylamide and epichlorohydrin; a reaction product of epichlorohydrin and cellulose; and a reaction product of epichlorohydrin and a cellulose derivative.

73. (New) The microporous membrane as claimed in claim 58 wherein said polyfunctional epoxy compound is at least one member selected from the group consisting of glycerol triglycidyl ether; diglycerol triglycidyl ether; pentaerythritol triglycidyl ether; sorbitol triglycidyl ether; glycerol propoxylate triglycidyl ether; trimethylolpropane triglycidyl ether; 1,1,1-tris(hydroxymethyl)ethane triglycidyl ether; 1,1,1-tris(hydroxyphenyl)ethane triglycidyl ether; tris(hydroxymethyl)nitromethane triglycidyl ether; tris(2,3-epoxypropyl)isocyanurate; phloroglucinol triglycidyl ether; N,N-diglycidyl-4-glycidyl oxyaniline; a reaction product of epichlorohydrin and 1,3,5,-tris(2-hydroxyethyl)cyanuric acid; a reaction product of epichlorohydrin and tris(hydroxymethyl)amino methane; sorbitol tetraglycidyl ether; pentaerythritol tetraglycidyl ether; polyglycerol tetraglycidyl ether; 4,4'-methylenebis(N,N-diglycidylaniline); sorbitol pentaglycidyl ether; sorbitol hexaglycidyl ether; polyglycerol polyglycidyl ether; a reaction product of polyvinyl alcohol and epichlorohydrin; a reaction product of polyvinyl phenol and epichlorohydrin; a reaction product of polyacrylamide and epichlorohydrin; a reaction product of epichlorohydrin and cellulose; and a reaction product of epichlorohydrin and a cellulose derivative.

74. (New) The microporous membrane as claimed in claim 58 wherein said polyfunctional epoxy compound comprises at least four epoxy groups.

75. (New) The microporous membrane as claimed in claim 74 wherein said polyfunctional epoxy compound is at least one member selected from the group consisting of sorbitol tetraglycidyl ether; pentaerythritol tetraglycidyl ether; polyglycerol tetraglycidyl ether; 4,4'-methylenebis(N,N-diglycidylaniline); sorbitol pentaglycidyl ether; sorbitol hexaglycidyl ether; polyglycerol polyglycidyl ether; a reaction product of polyvinyl alcohol and epichlorohydrin; a reaction product of polyvinyl phenol and epichlorohydrin; a reaction product of polyacrylamide and epichlorohydrin; a reaction product of epichlorohydrin and cellulose; and a reaction product of epichlorohydrin and a cellulose derivative.

76. (New) A microporous membrane comprising:

(a) a microporous support; and

(b) a hydrophilic coating directly on said microporous support, said hydrophilic coating being made by (i) applying to the microporous support a quantity of a polyfunctional epoxy compound, said polyfunctional epoxy compound comprising at least two epoxy groups, and (ii) then, cross-linking the polyfunctional epoxy compound in such a manner as to yield a water-insoluble polymer, wherein said water-insoluble polymer is neutrally charged.

77. (New) The microporous membrane as claimed in claim 76 wherein said polyfunctional epoxy compound is neutrally charged.

78. (New) The microporous membrane as claimed in claim 77 wherein said polyfunctional epoxy compound is cross-linked using a cross-linking compound, said cross-linking compound being neutrally charged.